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Understanding land-use change conflict: a systematic review of case studies

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ABSTRACT

The growing demand for food, water, and shelter change the way people use land. These changes have affected or even caused conflict in several locations. However, conflicts do not erupt in isolation; they are the result of multiple interacting causes. There is limited structural understanding of these causes. In this study, we systematically coded case studies that report on conflict related to land-use change, including deforestation in commodity frontiers, agricultural development on common land, and urban development. Based on an analysis of 62 cases, we identified population growth, overlapping land rights, ethnic fragmentation, and economic inequality as the most frequently reported root causes, while rises in land prices was the most often reported proximate cause. Reported institutional causes suggest that the problem is not necessarily the complete absence of governance mechanisms, but rather that governance mechanisms are not fully equipped to deal with the complexities of the observed land-use changes.

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land-use change conflict; land-use change; deforestation; agricultural intensification; urban development

Introduction

Over the past decades, human activity has severely altered a large proportion of the planet's land surface. The demand for food, water and shelter for the growing number of people on earth has led to large-scale clearing of forests, expansion of urban areas, and development and further intensification of agricultural areas (Ellis et al., 2013; Foley, 2005). Under a middle-of-the-road scenario, an increase of 30% to 80% in produce is required to serve the growing population by 2050 (Van der Esch et al., 2017). In addition, land degradation and climate change are expected to alter biophysical conditions and cause geographical shifts in the land that is suitable for agricultural activities. As a result, diverging land uses are expected to increasingly compete for the available land (Lambin & Meyfroidt, 2011).

The increased demand for multiple land use types cannot always be met, given the limited amount of land that is available. Global stakeholders such as non-governmental organisations, the United Nations (UN), and national governments are increasingly concerned with the prospect of intensified competition over land (United Nations Human Settlements Program, 2018). Land is often found to be a factor in conflict (Global Land Tool Network & Land and Conflict Coalition, 2017; Ide, 2015; Kalabamu, 2019), ranging from land disputes that trigger a broader conflict, to competition over land hindering stabilisation and recovery efforts in the aftermath of violence (United Nations Human Settlements Program, 2018). In the scientific literature, land degradation and scarcity of arable land have been incorporated into the broader academic debate on the relationship between

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climate change, resource scarcity, and violent conflict (Van Leeuwen & Van Der Haar, 2016). More recently, academic research has also focused on the role of economic globalisation and the engagement of multinational agribusinesses in large-scale land acquisitions (LSLAs) (Hunsberger et al., 2015).

Previous findings on conflict in relation to environmental change vary (Buhaug, 2015; Ide & Scheffran, 2014). A recent study by Mach et al. (2019) confirms that climate has affected armed conflict in some countries and identified natural resource dependency as one of the potential factors to play a role in this relationship. However, the exact mechanisms of the relation between climate and conflict dynamics remain uncertain (Buhaug, 2015; Gleditsch & Nordås, 2014; Mach et al., 2019; Scheffran et al., 2012; Theisen, 2017). Mach et al. (2019) frame these uncertain mechanisms as climate-conflict linkages; recognising a relation but acknowledging the contextual impacts of socio-economic and governance factors under which this linkage leads to an actual conflict. In line with these climate-conflict linkages, the relationship between land-use change and conflict is uncertain and contextual. For example, Bob (2011) discusses different types of land conflict, such as gender-related conflict over land and the distribution of benefits over land development projects. In addition, Froese and Schilling (2019) discuss the nexus between climate change, land use, and conflict. Their study discusses how climate change, mitigation and adaptation projects may affect conflicts over land, and emphasise that local contextual factors differ.

Most of the literature on land-related conflict concerns in-depth, qualitative case studies. Yet, by nature, case studies provide little insight into the general relationship between land-use change and conflict. Two recent publications discuss the identification of the proximate- and root causes of environmental conflict. The Global Land Tool Network & Land and Conflict Coalition (2017) and the early warning indicators of conflict as identified by the United Nations Interagency Framework Team for Preventive Action (2012). However, these studies lack a systematic research methodology, as well as an assessment of how proximate- and root causes interact.

The objective of this study is to identify the circumstances under which different types of land-use change lead to conflict, referred to as a land-use conflict linkages (Mach et al., 2019). Following the general model by Chris Mitchell, we define conflict as 'any situation in which two or more parties perceive that they possess mutually incompatible goals' (Mitchell, 1981, p. 17). This definition allows for a broad interpretation of conflict, in contrast to other definitions that solely focus on violent conflict. The next section first reviews various views on the relation between environmental change and conflict which serve as the conceptual starting point for the coding of the case studies. Subsequently, the materials and methods section explains how case studies were collected and coded, followed by a presentation of the results and a discussion of these results within the context of the theories reviewed.

Theoretical background

The main schools of thought relevant for the relationship between environmental change and conflict are neo-Malthusianism, political ecology, and legal anthropology, as well as the livelihoods and vulnerability frameworks. These frameworks differ on many issues, yet also have common features (Ide & Scheffran, 2014).

The overarching argument of the neo-Malthusian school of thought is that environmental degradation and climate change, in combination with population growth, lead to resource scarcity, which in turn directly threatens livelihoods and thereby increases the likelihood of conflict (Bernauer et al., 2012). Homer-Dixon, writing from the neo-Malthusian perspective, more specifically states that decreasing access to renewable resources, such as arable land, increases frustration. This, in turn, creates grievances against the state, weakens the state and civil society, and increases the chances of conflict (Homer-Dixon, 1999). Other authors, such as Ester Boserup, offer the opposing view that population growth and increasing demand for agricultural land does not lead to conflict, but rather facilitates institutional and technological innovations (Boserup, 2017). As a result, improved

technologies can be adopted that help reduce diminishing returns in natural resource use (Kabubo-Mariara, 2007). Although the neo-Malthusian school of thought has often been criticised for its deterministic perspective on the relationship between environmental scarcity and conflict, the framework still contains core elements that are brought forward in the environmental conflict literature.

Two of the most important theories that criticise the neo-Malthusian perspective are political ecology and legal anthropology. The most prominent critique of both centres around the idea that the neo-Malthusian theory places too much emphasis on the environmental aspects of conflict. Without completely contradicting the views of Homer-Dixon and his colleagues, these frameworks refine the environment–conflict thesis by placing more emphasis on the aspect of what Homer-Dixon calls structural inequality (Bryant, 1998; Peluso & Watts, 2001). First, within the literature on political ecology, a central focus is on the political processes of inclusion and exclusion that comes with the division of natural resources, and on the 'political sources, conditions and ramifications of environmental change' (Bryant, 1992, p. 13). Therefore, environmental change and scarcity, in themselves, are not necessarily the most important factors leading to conflict. Instead, it is due to feelings of injustice over how the available resources are divided which cause instability and social unrest (Baird, 2014). Second, the perspective of legal anthropology centres around the importance of the political nature of legislation that divides the resources in society (Gleditsch, 1998). Especially when focusing on land rights, conflicts arise from contradictions between, and contested application of, different bodies of legislation (Van Leeuwen & Van Der Haar, 2016). This, in turn, may lead to a situation of 'forum shopping', in which disputants who have a choice between various institutional bodies choose the legal bodies or legislation types that they expect will rule in their favour. As a result, contestants with the best access to institutional bodies are more prone to win a dispute (Benda-Beckmann, 1981).

The sustainable livelihood framework, and, to a lesser extent, the vulnerability framework, offer a lens to focus on the dynamics at household level that can play a role in environmental conflict (Deligiannis, 2012; Ghimire et al., 2010; Ratner et al., 2013). Both frameworks are multifaceted and have been used in several variations to describe the susceptibility to harm, powerlessness and marginality of both physical and social systems (Adger, 2006). These variations derive from a definition of vulnerability presented by the IPCC as: 'The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.' (IPCC, 2014; Field & Barros, 2014). In addition to familiar structural factors, such as institutional arrangements, demographic changes and climate, the livelihood and vulnerability frameworks emphasise the capacity of households, communities and countries to adapt to environmental changes (United Nations Development Programme, 2017). When focusing specifically on the impacts of land-use changes, some causes of conflict can be identified from the livelihood framework. First, a lack of income diversity and a high dependence on agriculture, which leaves a society economically vulnerable in the case of land-use changes that interfere with these agricultural activities. Second, economic inequality and the absence of democratic institutions lead to an absence of bottom-up decision-making processes that are necessary to facilitate adaptation to land-use change on a local level (United Nations Development Programme, 2017).

Materials and Methods

Overview

We conducted a systematic review of case studies reporting on conflict related to land-use change. The design of this review follows the design as suggested in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA, see Moher et al., 2009). The associated flow diagram and PRISMA checklist are provided in the supplementary material

Case collection

The systematic review is based on a selection of case studies that have been published in peer-reviewed scientific journals in English. For the first selection, the following search query was used: *(('land use change' OR urbanization OR desertification OR deforestation OR 'agricultural intensification' OR afforestation OR reforestation) AND Conflict)*. This search string, combining the term 'land-use change' and the most frequently cited land-use changes, with the broad term 'conflict' has been selected to come up specifically with articles describing a conflict related to land-use change, and not issues with a general form of land use. Furthermore, the selection of the term conflict instead of more specific additions such as violence, protests etc. has been made in order to prevent creating a bias towards certain types of conflict. Although the same might be true for the land-use changes used in the search term; creating a bias to those changes included, we found that merely searching for 'land-use change AND conflict' did not generate research with a sufficient focus on the conflict dynamics. This can partly be explained by the fact that the conflict- and social sciences literature, from which most of the case studies found stem, does not often use the broader concept of 'land-use change', but more specific terms such as urbanisation and desertification. Therefore, we recognise a limited risk for bias towards some land-use changes deriving from the search term used.

We used Scopus as a database for collecting cases since it is the largest relevant database in the field of Social Sciences. Nearly all journals included in the alternative, Web of Science, are also included in Scopus, while the opposite is not true (Mongeon & Paul-Hus, 2016). From the resulting lists of publications, the articles that met the following criteria were selected:

(1) The article describes a case study at national or subnational level. A case is defined as a specific combination of a particular change in land use, a conflict, and a well-defined location that is analysed, within one publication.
(2) The case study specifically addresses a change in land-use activities as a characteristic of the conflict and provides reflection on the causes of the analysed conflict.
(3) The conflict is at least a 'non-violent crisis', i.e. Type-II intensity level as defined in the HIIK conflict intensity model presented below (HIIK, 2019).

We did not further constrain our eligibility criteria to specific methodological approaches or towards specific scales of analysis (as long as the described case related to a specific conflict, which is inherently limited in scale). We are aware that this hampers the comparability of cases (e.g. Margulies et al., 2016) but applying stricter criteria would yield unacceptable trade-offs in terms of the number of cases included.

The papers found in systematic search were subsequently used for a round of snowball sampling. Subsequently, all articles were assessed in more detail for inclusion in the review using the eligibility criteria mentioned above. A specific distinction was made between studies discussing several research sites but analysing these sites as one conflict (which we treated as one case), and studies that reported multiple cases of conflict. When a publication separately described and analysed conflicts in different case study areas, these were treated as separate cases in this review. Any duplications of case studies published by the same authors, not including a new type of methodological or theoretical approach and referring to the same case study area and period, were treated as one case. In all other instances, the studies were coded separately.

Case coding

For all cases, we coded the following information: case study location, data acquisition method, type of land-use change, level of conflict intensity, type of conflict in terms of intensity, proximate causes and root causes underlying the reported conflict. The first author coded all cases, from which a sample has been cross-checked by one of the co-authors and a second reviewer.

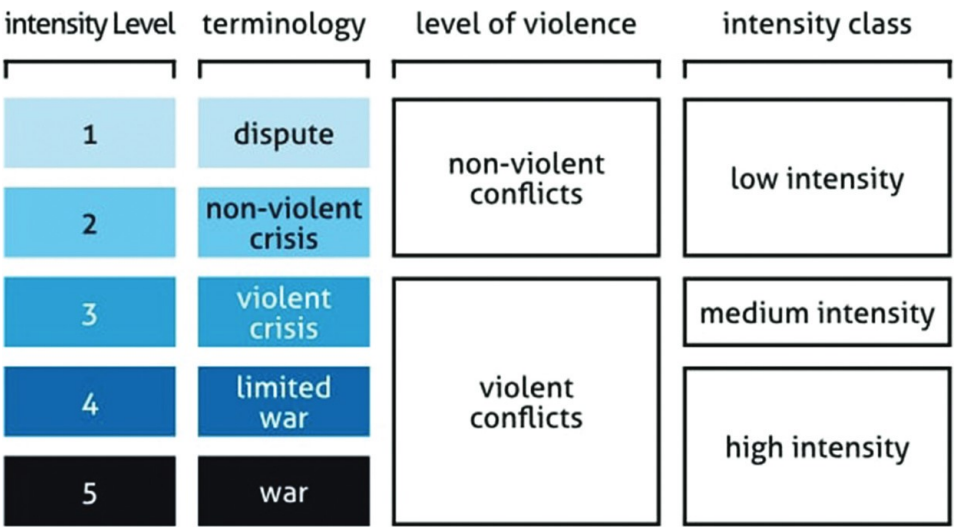

Figure 1 Conflict intensity framework (HIIK, 2019, adopted with permission).

We distinguish between various levels of conflict intensity following the Heidelberg Institute for International Conflict Research (HIIK, 2019) (Figure, p. 1). The categories are based on an assessment of the means and consequences of conflict. Category one (intensity level 2 in figure 1), non-violent crises, are those conflicts that express discontent of communities, groups or individuals with regard to (perceived) unevenly distributed gains and losses from land productivity or ownership; land grabbing without physical violence; limited or absent access to political representation or (perceived) unfair land tenure. A characteristic that sets a non-violent crisis apart from a dispute (which is not included in this search) is that one of the actors is threatening to act on their discontent by the use of violence to people, large-scale evictions or physically damaging or destroying objects or livestock. Category two (intensity level 3 in figure 1), violent crises, includes all the land-use related conflicts in which violence is used infrequently against a person or object. This category includes murder of community members, violent radicalisation, violent invasions of land, violent security forces, violence in the fight for land rights or eviction. For category three (intensity level 4 in figure 1), defined as limited war, violence is a structural aspect of the conflict. Wars typically exceeds the land use related sphere and is thus omitted here. Making a distinction between different types of conflict in this study facilitates the comparison between case studies. In addition, it also provides insights into the types of conflict that can arise under specific circumstances. This is a particularly relevant question since much of the previous research on the relationship between environment and conflict is limited to cases of violent conflict.

For all cases we coded the proximate causes and root causes reported. Proximate causes in this context refer to actual events directly leading to or triggering the reported conflict, such as elections and extreme weather events while root causes refer to the more fundamental processes that ultimately cause these conflicts, such as economic inequality and the absence of democratic institutions (Peacebuilding Centre, 2013). This framework is conceptually similar to the framework of proximate causes and underlying drivers frequently used in land-use change analyses (Geist & Lambin, 2002; Van Vliet et al., 2016).

Since environmental factors are often perceived as structural elements, neglecting intermediate effects has been identified as a weakness of the more quantitative studies on the relationship between environmental changes and conflict (Bernauer et al., 2012). For the purpose of this research, the deep historical grievances and structural causes as presented by the U.N. will be incorporated into the category of 'root causes' since they are often closely related and therefore difficult to separate for analysis.

The coding has been conducted based on the interpretation of the conflict situation by the authors of the original case studies. If the original publication indicates a root cause or proximate

cause that links land use to a conflict, it was included as such in this study. Throughout the coding process, a certain degree of interpretation of the original authors' description of causes was necessary to facilitate comparison between case studies and aggregation into causes that resonated among multiple case studies. However, we reckon that our interpretation is limited to such a degree that it is still reproducible. This limited degree of interpretation by the researchers is, however, at the same time also a strength because this specific method allows for the appreciation of details, complicated relationships and contextual factors that tend to get lost in a large-N approach. The coding process was carried out in an iterative manner, starting from a preliminary list of root causes and proximate causes based on the main schools of thought applied in environmental conflict analysis, as described in the theoretical framework. Newly found causes in the case studies were added to the coding sheet once they did not fit any of the pre-established ones. A complete overview of the included causes with the belonging references are provided in the supplementary material. Only causes that were reported in the case study descriptions are presented in this paper.

Analysis of coding

After the coding process, we analysed the results in three steps. First, an overview was created of case study characteristics, such as geographical spread and type of land-use change, to provide better insight into the types of cases studied and the representativeness of results. Second, we identified which causes were most frequently mentioned in relation to these conflicts. Finally, we used the registration of conflict intensity in combination with coded causes to give an overview of the causes that were most strongly related to the use of violence.

After coding the articles and establishing the underlying and proximate causes of conflict, we identified linkages between land-use changes and conflict based on the coded causes. Linkages here refer to the conditions or circumstances under which a certain land-use change leads to a conflict. Following Mach et al. (2019), these linkages are causal in nature, although the type and strength of the causality can vary. Meyfroidt (2018) describes different types of causal relations in the context of land-use science, including necessary and sufficient causes but also including contributing causes. The nature and idiosyncrasy of land-use conflicts makes it inherently difficult to establish strong causality (i.e. necessary or sufficient causes), as it is neither possible nor desirable to study them in a controlled setting. Moreover, because most of all land-use changes do not lead to conflicts, we anticipate that linkages denote primarily contributing causes, i.e. conditions and factors that increase the probability of a conflict arising from a particular land-use change. Starting from the types of land-use changes, we identified linkages between deforestation, agricultural intensification, and urbanisation, respectively, to conflicts.

Results

Case study characteristics

Our systematic search yielded 66 publications that, together, reported on 62 cases of conflict related to land-use change. The included articles are all relatively recent, with publication dates ranging from 1998 to 2019. Most cases (42 out of 62, or 68%) used surveys or interviews as a method to gain in-depth and first-hand insight into the dynamics of a conflict. Nineteen of the studies combined the results from these surveys or interviews with secondary data. Only 15% of the case studies used some form of spatial analysis in their research. A complete list of the selected cases, including their coding, is provided in the supplementary material.

Cases were distributed roughly equally over the various conflict levels, with 36% of cases representing a limited war, and non-violent crisis and violent crisis each representing 32%. Geographically, they were concentrated in a limited number of countries, with 11 in Brazil, 9 in Ethiopia, 9 in Kenya and 6 in Mali. Figure 2 provides a geographic overview of the case study

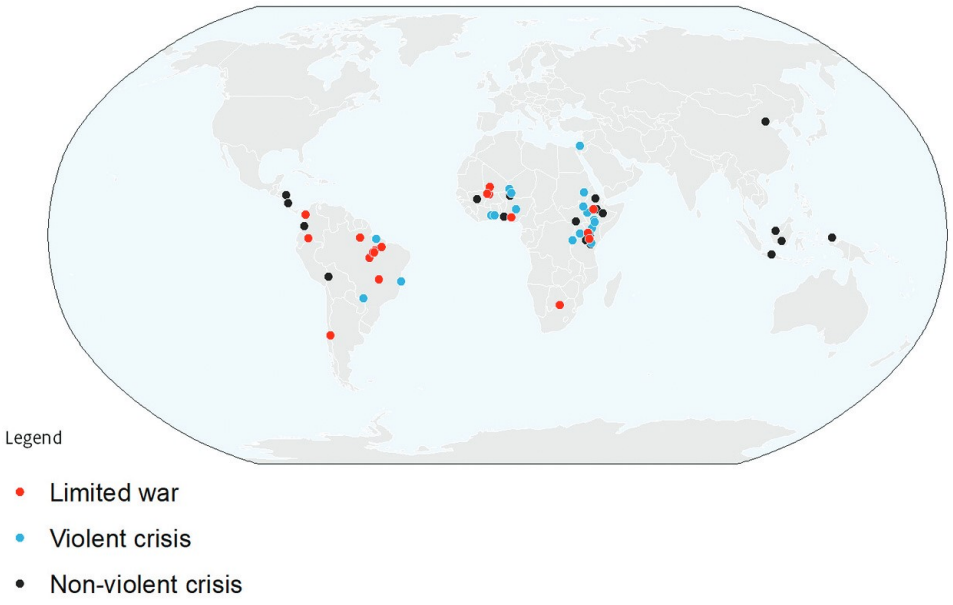

Figure 2 Case study locations

locations. Three of the studies were on a national level or did not specifically state a region or location of focus, and in these cases the country's capital is shown on the map as the location. Most of the case studies relate to deforestation and agricultural development. Cases related to forest usage and urban development were less frequently reported (Figure 3). To allow for some more

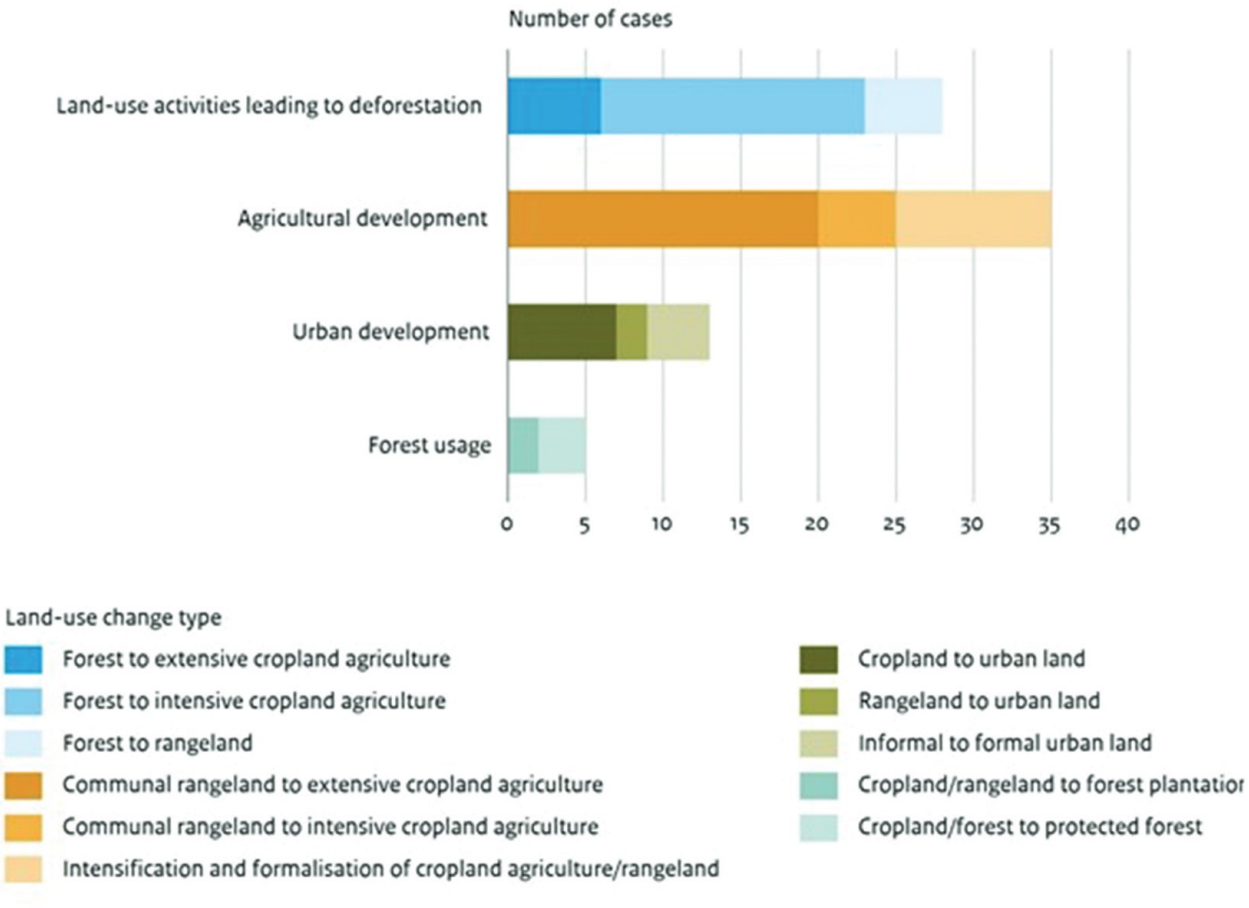

Figure 3 Distribution of selected articles per type of land-use change

understanding of the types of land-use changes found, we subdivided the 4 broader categories into 11, based on how the land-use change is described in the articles we reviewed.

Proximate causes and root causes of conflict

To summarise the result of the codification process, Tables 1 and 2 provide an overview of the rate of occurrence of proximate causes and root causes of the conflicts identified. The causes were categorised as 'demographic', 'economic', 'institutional', 'sociocultural' or 'environmental'. Some observations can be made from this overview. The category of institutional causes is strongly represented. Not only do most causes fit within this category, but they are also relatively frequently mentioned. Furthermore, important economic causes, such as inequality and a high dependence on agriculture, can also and at least partly be attributed to institutional factors.

Distinction between levels of conflict intensity

One of the questions formulated at the beginning of this research concerned the identification of specific causes and land-use changes that could influence the intensity of the conflicts we reviewed. Based on our review, we found certain causes to be related to specific levels of conflict intensity. First, in our selection of cases, violence was linked more strongly to migration than to natural population growth. Second, interestingly, the absence of conflict resolution mechanisms, democratic institutions for land governance, and formal land rights systems does not appear to lead to a higher incidence of violent conflict. Rather, these root causes were most frequently cited in cases with lower conflict intensity levels. A lack of capacity for policy implementation, overlapping land rights, and economic inequality do show a positive relationship with increasing levels of conflict intensity. When focusing on proximate causes, rising land prices, actions of conflict entrepreneurs and legal violations are mentioned most frequently, specifically in combination with high conflict intensity. In cases with high intensity conflict, a specific proximate cause of conflict could be identified more often than

Table 1. Root causes of reported land-use change conflict.

Underlying driver	Name	Count	%
Demographic causes	Population growth (natural/undefined)	24	39%
	Migration	27	44%
Economic causes	Economic Inequality	29	47%
	Asymmetric landownership	24	39%
	High dependence on agriculture	26	42%
	GDP growth	0	0%
	High unemployment	2	3%
Institutional causes	Absence of conflict resolution mechanisms	20	32%
	Absence of democratic institutions for land governance	1020	16%
	Absence of formal land rights systems		32%
	Neglecting indigenous land rights	25	40%
	Lacking capacity for policy implementation	18	29%
	Overlapping land rights	41	66%
	Corruption	30	48%
Sociocultural causes	Ethnic fragmentation	33	53%

Table 2. Proximate causes of reported land-use change conflict.

Proximate Cause	Name	Count	%
Economic Causes	Rise in land prices	20	32%
Institutional Causes	Elections	1	2%
	Change in legislation	12	19%
	Legal violations	13	21%
Sociocultural Causes	Actions of conflict entrepreneurs	13	21%
Environmental Causes	Extreme weather events	11	18%

in those with lower level of intensity. Finally, in all three identified types, case studies concerning deforestation link in general to higher levels of violence. The supplementary material provides a detailed overview of the frequency of causes, and type of land-use changes found in the case studies, sorted based on conflict intensity.

Land-use change and conflict linkages

The causes of conflict that have been identified in this review provide insights into the main patterns through which land-use changes may contribute to conflict, in combination with socioeconomic factors. We identified three overarching linkages that occur mostly in specific regions of the world in relation to certain types of land-use change.

Deforestation at the commodity frontier

The first link is characterised by conflicts arising from deforestation as a result of agricultural land-use activities. In total, we identified 21 case studies that fit this pattern, with a regional emphasis on Latin America and Southeast Asia. These were found, on average, to be more violent than those in other studies, with more than half of them representing a limited war. Furthermore, nearly all these cases are characterised by many mentions of economic inequality and corruption, neglect of indigenous land rights and overlapping land rights. Most notably, for this linkage, almost half of the case studies report rising land prices as a proximate cause of conflict, whereas other linkages show no specific proximate cause that stands out. The above-mentioned characteristics can largely be explained by the commodity frontiers and a strong presence of well-organised social movements in the persistence of these conflicts (Moore, 2000).

Some exemplary case studies of commodity frontier conflict are that of oil exploration in the Yasuní rainforest (Gilbert, 2018), agricultural expansion and timber logging the Eastern Amazon (De Oliveira, 2008), and palm oil plantations in Indonesia (Obidzinski et al., 2012). Gilbert describes a case study in which the Waorani indigenous group in Ecuador refuses to vacate its ancestral lands in the Yasuní rainforest, which for them represents an invaluable asset for maintaining their traditional lifestyle. However, the Yasuní rainforest has suffered from large-scale encroachment and deforestation by extractive industries, such as those of oil and timber. As a result, the remaining preserved part of the rainforest has served as a refuge for many groups that compete over the same territory, which has transformed the remaining frontier into 'a site of violent territorialisation' (Gilbert, 2018, p. 244). Emerging commodity frontiers also explain the role of rising land prices as a cause of conflict, since large-scale clearing of forest leads to people scrambling to obtain land, rising land prices, and consequential clashes in the remaining areas. This process also works the other way around, with rising land prices making the clearing of forests more attractive, financially speaking. Although the social movements are less visible and the conflicts less violent, cases of large-scale biofuel plantations, such as those in Indonesia described by Obidzinski et al. (2012), show similar characteristics, with indigenous forest inhabitants suffering from deforestation by extractive industries.

Agricultural development on communal lands

The second link between land-use change and conflict centres around the transformation of communal areas used for pastoralism or a mix of agriculture and pastoralism into often privatised areas that are more intensively used for sedentary agriculture. In addition, the transfer of informal, extensive agriculture towards large-scale, often mechanised agricultural practices can be included in this linkage, due to large similarities between case studies. The 24 case studies we identified are all situated in rural parts of Africa. Reported conflicts are typically less violent than in the conflicts resulting from deforestation, although six cases were still classified as 'limited war'. When it comes to causes, ethnic fragmentation is mentioned most often as a contextual factor linking agricultural development to conflicts (17 of 24 cases). Furthermore, a high dependence on agriculture as well as population growth and absence of formally documented land rights are frequently cited root causes that differ from those in the

deforestation linkage. Extreme weather events were the most important proximate cause, but these are mentioned in only a little over one third of the cases. In contrast to the link between deforestation and conflict, social movements play only a minor role, with just five cases reporting this as a type of conflict.

An exemplary case describes pastoralism and land tenure change in the Baringo highlands of Kenya (Greiner, 2017). Until recently, the Pokot people inhabiting these highlands practised semi-nomadic pastoralism. However, over the last decade they are rapidly sedentarising and adopting rain-fed agriculture. As a result, claims to private land ownership of previously communal rangelands have steadily risen and threaten peaceful coexistence in the community. Many of the highland areas are now demarcated, fenced and privately claimed. Migration of people from low-lying areas to the more fertile highland areas, in combination with steep natural population growth, worsens the competition for land ownership (Greiner, 2017). In this case, the institutions that are usually responsible for arbitration with respect to the – officially still communal – lands are having an increasingly hard time in solving the conflicts. This has led to a situation in which land tenure is highly insecure, especially for marginalised groups. State intervention and official demarcation of land, here, is seen as the ultimate solution for the increase in the number of conflicts (Greiner, 2017). However, other cases tell a different story, with attempts to formalise land rights only having worsened similar situations (McPeak & Little, 2018)

The link between agricultural development and conflict can hardly be addressed without reflecting on large-scale land acquisition (LSLA), also sometimes referred to as land grabbing. This LSLA refers to 'transnational and national economic actors from various large business sectors [. . .] eagerly acquiring, or declaring their intention to acquire, large swathes of land on which to build, maintain or extend large-scale extractive and agro-industrial enterprises' (Borras & Franco, 2012, p. 37). The large-scale acquisition of agricultural land is practised by countries or private investors who are economically rich, but relatively limited in natural resources, with the aim of securing their food and energy supply for the future and ensuring large-scale control of land holdings beyond national borders (BORRAS JR & Franco, 2012). In the case studies we reviewed, land grabbing was identified as the reason for land-use change, for instance, in the south-western Highlands of Ethiopia and Sudan (Ango, 2018; Sulieman, 2015). More specifically, large-scale farmers played a role in 25% of all cases reviewed, and multinationals in 19%. In most cases, the involvement of large-scale farmers and especially multinationals concerned a form of LSLA.

Urban development

The linkage between urban development and conflict is supported by eight case studies. This is clearly fewer than the previous two types of linkages, but projections of urban expansion in many regions justify dedicating a separate analysis to this link (Chen et al., 2020). Furthermore, the combinations of causes and conflict intensities that we found in these case studies did reveal distinct patterns comparable to the other categories. We found various levels of conflict intensity in cases where urbanisation linked to conflict. Overlapping land rights, absence of formally registered land rights, ethnic fragmentation, corruption and in-migration were the most important root causes linking urbanisation to conflict. However, they occurred in only five of the eight reported cases. Rising land prices are an important proximate cause, which was reported in over half of the cases. Generally, the diversity in reported causes was relatively high, providing a less clear image of conflict dynamics. This could at least partly be attributed to the limited number of cases studied. An exemplary case study linking urbanisation and conflict is that of Obala and Mattingly (2014) article on Nairobi's urban land conflicts. This case study underlines the importance of corruption and economic inequality coinciding with ethnic cleavages which together make for a pressing situation and countless violent and non-violent conflicts in one of Sub-Saharan Africa's largest urban areas.

Discussion

In this study we reviewed the conditions under which land-use changes lead to conflicts, distinguishing between root causes and proximate causes of these conflicts as reported in 62 cases found in literature. Results show that overlapping land rights, ethnic fragmentation, and corruption are the most frequently reported root causes, followed by Economic inequality, migration, and high dependence on agriculture. Interestingly, economic causes such as high unemployment, and GDP growth are seldom reported if at all, even though it is generally acknowledged that low socioeconomic development is an important driver for environmental conflicts (Mach et al., 2019). This could of course be attributed to the limited number of cases studied, but it does suggest that absolute economic stress, such as GDP growth and high unemployment, have less of an impact than the relative factor of economic inequality.

Conversely, our findings confirm the importance of institutions for governing land-use change processes, as the lack of institutions and formal land rights as well as legal plurality in the form of overlapping land rights were reported relatively frequently. Furthermore, it is noteworthy that, in 55% of cases, legal action was taken by those involved in the conflict. This suggests that the problem is not necessarily the absence of governance mechanisms, but rather that governance mechanisms are not fully equipped to deal with the complexities of the reported land-use changes. The mechanisms could be formally available but not operating in practice or allow for disputants to go 'forum shopping' between the various legislative bodies. In Burundi, for instance, the additional institutional arrangements on land governance that were established after the peace agreements of 2000, were found to fuel conflict because of the increased complexities and the failure of implementation mechanisms (Tchatchoua-Djomo, 2018).

Most of the cases reviewed in this study are in or near the tropics. This is consistent with the locations of conflicts in general, as 72% of all conflict events between 1946 and 2019 are in the tropics according to the ACLED conflict database (Raleigh et al., 2010). A likely reason for this is the overlap between causes of conflict in general and land-use conflict specifically, most importantly those related to lower socio-economic development. This could mean that conflict related to land-use change occur more often in certain areas than in others, but it could also be explained by the selection of articles published in English, as well as by a longstanding scientific interest in certain areas within the environmental conflict literature, such as the Brazilian rainforest and the agro-pastoralism conflicts in Kenya, the so-called streetlight effect, as addressed by Adams et al. (2018). Yet, despite attempts to broaden the selection criteria to avoid overrepresentation of the most well-known cases of conflict in which land-use change plays a role, a limited bias must be recognised in the spatial distribution of case studies towards these often-studied cases.

In this review we consider the causes under which land-use change can lead to conflict while conflict can also affect land-use change. Especially violent conflict as well as post-conflict peace-building have been related to farmland abandonment, agricultural expansion, deforestation and the disruption of access to land-based resources (Baumann et al., 2015; Unruh & Williams, 2013). Baumann et al. (2015) for example, indicate that the Nagorno-Karabakh conflict led to substantial displacement of agricultural activities to nearby Azerbaijani areas, while only a small fraction of abandoned fields were cultivated afterwards, suggesting that a large share of the conflict-driven changes were permanent. However, while some land-use change conflicts can last for long time periods (see for example, Campbell et al., 2000), the cases reviewed in this study do not reveal systematic evidence of a recursive relation between land-use change and conflict.

Several dimensions affect the comparability between case studies. First, perception of the cases. In the reviewed papers, information regarding causes is mostly derived from interviews, which mainly provides information on the perceived causal inferences of the respondents (Tellis, 1997). These studies therefore indicate how people perceive the causes of a conflict, and thus also the role of land-use change in this relationship. Since the actions of the people involved shape a conflict, this element is crucial to understanding conflict dynamics. Surely, the exact relationship between various root

causes and proximate causes remains complex and could differ from the perception of interviewees, affecting exact comparability. Second, spatial scale. We did not restrict our search to specific spatial scales other than national or subnational, nor did we search for specific methods, similar to other reviews (e.g. Van Vliet et al., 2015). The difference in scale of the cases included could hamper the comparability of cases (see Margulies et al., 2016). Yet, our national-scale and regional-scale studies eventually report on the local manifestations of reported land-use conflicts (e.g. Pritchard, 2013; Zimerman 2016), thus increasing the comparability of cases as the scale of the phenomena studied are relatively similar. Moreover, restricting our review to local cases only would come at a cost of the number of cases which was deemed undesirable. Third, the different methods allowed in included case studies could also hamper comparability. Yet, because we do not reanalyse primary data presented in cases but instead code cases and analyse the coding (a case-oriented meta-analysis according to Magliocca et al. (2015)), this is not constraining our study. In addition, the omission of any methodological eligibility criteria also allows for a wider scope in terms of evidence considered which potentially yields a more complete overview of causes that link land-use change to conflicts. Moreover, issues of comparability also exist within studies using the same methodology (see for example, Neumann & Hermans, 2017), and therefore such strict requirement would only partly solve this problem, while it would also further decrease the number of eligible cases.

Comparison of findings and theoretical frameworks

Several frameworks have been proposed to explain the relation between the use of natural resources, including land-use activities, and conflicts. Generally, aspects of all these frameworks can be recognised in our results, however with differences in the degree to which they score. Around 70% of all scores fit either within the political ecology or within the legal anthropology framework; around 55% fit within the neo-Malthusian framework; and around 30% fit either within the sustainable livelihood or within the vulnerability framework. The most important reason for this is that institutional causes dominate those found in the review (just over 50% of all scores). These factors are especially emphasised in the political ecology and legal anthropology frameworks. This finding provides support for the argument brought forward by these two frameworks that the way in which resources are distributed within a society, and the extent to which this can be contested, are central to the development of conflict. However, three out of the five most frequently reported root causes in this research (population growth, economic inequality, and corruption) are part of Homer-Dixon's neo-Malthusian framework, suggesting that this theoretical perspective is not as outdated as is often claimed by its critics. Ide and Scheffran (2014), on the other hand, emphasise that the impact of power relations on the distribution of resources, which is central to the political ecology framework, also plays an important role in the neo-Malthusian perspective (Homer-Dixon, 1994). Yet, the often-mentioned non-tangible values of land, such as the cultural affinity of indigenous people, are hard to fit into this framework.

From all the indicators selected from the livelihood's framework, only the high dependence on agriculture for income was stressed in our review. For the other factors deduced from this framework, we did not find any evidence. This is perhaps surprising, given the mostly regional and local perspective of the case studies reviewed. However, dependence on agriculture for the sustaining of livelihoods does represent the central argument of this framework, and some of the causes that were found to contribute to political ecology or neo-Malthusianism also find resonance in the livelihood and vulnerability approaches, like the high scores of the indicators 'neglecting of indigenous land rights' and 'rising land prices'. Therefore, concluding that these frameworks are not supported by the findings from this review would go too far.

Governing land use and the winners and losers of development

For many, land is not only an economic asset, but also and above all a historical-social construct, impregnated with values, culture and spirituality (Groppo & Da Passano, 2016). As brought forward in

the discussion on the Waorani indigenous people who are forced to fight for the remaining forest-land, and nomadic Pokot people from Ethiopia, land-use changes not only threaten livelihoods, but also long-standing cultural traditions and take away a central part of people's identity (Gilbert, 2018; Greiner, 2017). Therefore, dealing with conflict, in the context of land-use change is first and foremost about building and rebuilding the social contract between space, people and institutions that govern the land, and about establishing a process of trust and dialogue among stakeholders (Groppo & Da Passano, 2016). Just as the concept of land encompasses more than the territory, land governance is broader than government (e.g. Debonne et al., 2021). Especially in developing countries, where almost all the reviewed cases are located, state actors exist alongside customary, religious and/or informal counterparts (Fricska et al., 2009). An institutionalist approach emphasises how conflict management is facilitated by transparency, clear boundaries and rules (Ostrom, 1990). The finding by Ostrom is supported by the strong evidence found in our research that overlapping land rights and corruption are important root causes of land-use conflict.

The reviewed cases show that the introduction of new, formal systems of land rights, or well-intended redistributive reform measures should be executed carefully to prevent an escalation in an already volatile situation and are thus not necessarily the solution. As other authors have argued, processes of land tenure or property rights reform, which are set up in order to empower suppressed population groups, often at best achieve controversial or mixed results (Boone, 2019; Kalabamu, 2019). In Brazil, the introduction of redistributive land reforms has increased violence through the encouragement of illegal squatting (Alston et al., 2000; De Oliveira, 2008; Simmons, 2005). In Rwanda, the implementation of large-scale tenure formalisation and agricultural reform has strongly reduced livelihood security and has further destabilised the already volatile situation in rural areas (Pritchard, 2013). The formalisation and functioning of established institutions are strongly influenced by complex power relationships, corruption, and political allegiances, which increase the risk that institutions set up with the best intentions end up benefiting those with a traditional access to power (Benjaminsen & Lund, 2002). The agricultural and institutional reforms set up in the context of development with the goal of improving the economic situation of the countries involved inevitably lead to situations in which, again, there are winners and losers. The case study 'I am here until development comes' (LeVan & Olubowale, 2014) shows that this is not only the case in rural contexts of agricultural intensification, but also when it comes to large-scale programmes of modernisation and formalisation of landownership in urban areas.

Finally, it is important to note that, although the concept of conflict is most often perceived as socially undesirable, and therefore has a strong negative connotation to it, this is not necessarily always the case. Especially in the case of lower intensity conflicts, these could harness the potential to support actors to induce necessary changes in institutional arrangements (Snorek et al., 2014). In such cases, seemingly peaceful cooperation could mask latent conflict, or long-standing discriminations and injustice. Therefore, the often-made distinction of conflict being 'bad' and cooperation or absence of conflict being 'good' should be more carefully considered (Keohane, 2015).

Conclusion

In the coming decades, humans are expected to continue to change the ways in which land is used, under pressure of environmental degradation and a growing demand for food, feed, biofuels and raw materials. Therefore, it is crucial to understand how these changes in land use, in turn, impact society. Our systematic review resulted in a list of driving forces that were most prominently present in the studied cases. Population growth, especially due to migration, the presence of overlapping land rights, ethnic fragmentation, economic inequality and corruption were found to be the most important circumstances under which land-use change-related conflicts develop. The root causes of migration, a lack of capacity for policy implementation, overlapping land rights and economic inequality are more specifically connected to conflicts with a higher level of intensity. In the

categorisation of causes that were found to frequently occur, simultaneously, with certain types of land-use change, linkages could be distinguished between land-use change and conflict.

When it comes to risk assessments of conflict related to land-use change, a formal analysis requires a comparison of cases of such conflicts with other areas where conflicts do not occur. Insights into the process through which land-use change can lead to conflict can inform responses to conflict, as well as mitigating measures. However, it remains important to keep in mind that conflict cannot and should not fully be prevented. At low levels of intensity, conflict sometimes offers the only way for suppressed or disadvantaged people to improve their own position, and to optimise the way in which land is divided and governed.

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Code book

https://figshare.com/articles/dataset/Coding_Sheet_case_study_review_land_use_change_and_conflict/14564322
10.6084/m9.figshare.14564322

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